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## Dietary practice and nutrient intake of students living in the college accommodation of Wollongong University

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**DIETARY PRACTICE AND NUTRIENT  
INTAKE OF STUDENTS LIVING IN THE  
COLLEGE ACCOMMODATION OF  
WOLLONGONG UNIVERSITY**

**A major project submitted in partial fulfilment of the requirements for  
the award of the degree**

**MASTER OF PUBLIC HEALTH**

**from**

**THE UNIVERSITY OF WOLLONGONG**



**by**

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## ABSTRACT

A study was conducted to investigate the dietary practices of university students living in one of the accommodation facilities in the University of Wollongong. A self-administered questionnaire was distributed to students at the Weerona College. The questionnaire was designed to collect information on demographic factors, the eating patterns of the students, their attitudes towards diet, the food services provided by the college and dietary intake using a 24-hour recall method. The survey was analysed using Statistical Package for the Social Sciences (SPSS) (Norusis, 1990) and the dietary recall information was processed with the Diet-1 (version 3) computer package (Xyris Software, 1988 - 1991). Highlights from the results were that breakfast was the most often skipped meal by the students (the mean frequency of eating breakfast per week was 5.5 times, ranging from 0 to 7 times per week). "Lack of quality of food " and "too busy" were the two main reasons for skipping meals. Water, fruit and chocolate were reported as the most common snacks, followed by fruit juice, soft drinks and biscuit / cakes. From the 24-hour dietary recall information, most of the students met the Australian Recommended Dietary Intakes (RDIs) for major nutrients. The mean intakes of protein, retinol, vitamin C, iron, zinc, potassium, calcium, phosphorus and magnesium were all over 100 percent of RDIs, with particularly high intakes of protein and vitamin C. Some of the participants had considerably low retinol and calcium intakes. In the main, the respondents were satisfied with the food service in the college accommodation. However, many students also expressed their concern about some aspects of the college food service, especially relating to some cooking ways. Recommendations have been made to the college such as lengthening the dinner time, alternating some cooking methods ( less deep fried foods ) and more fresh vegetables and fruits. Because the dietary intakes of the subjects in this study were mainly in line with the

recommended amounts, this indicated that the food service at the college appeared to meet the nutritional needs of the university students.

# **DIETARY PRACTICE AND NUTRIENT INTAKE OF STUDENTS LIVING IN THE COLLEGE ACCOMMODATION OF WOLLONGONG UNIVERSITY**

## **CHAPTER 1 INTRODUCTION**

University students represent a population which is aged from late adolescent-hood to early adult-hood. In the University of Wollongong, 6900 of the 8800 students enrolled in 1990 were less than 30 years. This age group has been stable at about 78 percent since 1985. ( University of Wollongong, 1991 ).

For many, starting university also means living away from home. Many university students live in residential accommodation. This is a transitional period between living with parents and living independently. New responsibilities, including food decisions are faced by many students, either Australian regional students or international students coming to study from overseas. Poor food habits during this stage can result in serious consequences that can be further aggravated by physical stress and emotional problems. Examples of nutrition-related problems common with this age group are the eating disorders such as anorexia and bulimia nervosa. Both of these are characterised by refusal to eat or self-starvation, due to intense fear of gaining weight or becoming fat, even though they may be underweight. The causes of eating disorders are not well understood, though various physical, social, cultural and especially psychological factors have been used to explain their development and maintenance (Szmukler, 1989).

About 10 percent of students studying in Wollongong University are from overseas each year since 1986 ( University of Wollongong, 1991 ). Living in a culture different from one's own, overseas students may feel the food is not what they used to eat and the time and place for meals are different from when and where they usually eat, besides being exposed to new social and academic environments ( University of Wollongong, 1990 ). Obviously, this is a group needs support to live happily and healthily and to work effectively and efficiently.

The University of Wollongong provides accommodation for 840 students in five residential facilities, of which two are collegiate - International House and Weerona College. About one-third of this accommodation is provided to international students ( University of Wollongong, 1991 ). As previous studies have indicated, student's residence not only affects food selection but also significantly influences nutrient intake ( Beerman, 1990, 1991). Thus, study of the food habits and dietary intake of students living in the University of Wollongong accommodation would be useful to provide a profile of the students' diets and to determine the appropriateness and the need for improvement of the college food services.



## **1.1 Aims of the Study**

This study investigated the dietary practices of the college students living in one of the University of Wollongong's accommodation facilities and aimed to :

1. Describe the eating patterns of the college students.
2. Determine the nutrient intake of the college students, as compared with the Australian Recommended Dietary Intake ( RDIs ) for nutrients.
3. Compare eating patterns to dietary intake assessed by 24 hour recall.
4. Discuss the influence of social factors on food habits of these students.
5. Identify whether students are satisfied with the food provided by the college - if not, why not.
6. Report back to the college with recommendations from students on what changes they would like regarding food provision at the college.

## CHAPTER 2 LITERATURE REVIEW

### 2.1 Food, Nutrition and Health

Nutrients in food enable people to live, to grow, to keep healthy and well, and to be active. Food intake meets the needs of the body. Health is dependent on correct nutrition. There has been increasing consideration given to the modern diet and its relationship to health.. As in many other countries in the world, the Australian governments and communities are accepting that nutrition is a major factor affecting not only growth and health, but also the quality of the lives of Australian residents. The Commonwealth Department of Health has examined the role of diet in a wide range of chronic diseases common in Australia and concluded that improved nutrition provides a major opportunity to achieve better health for Australians (Better Health Commission, 1987 ). Drawn up by the Commonwealth Department of Health, the 'Dietary Goals for Australia', the 'Recommended Dietary Intakes for Australians' (RDIs), the 'Dietary Guidelines for Australians' and the 'Dietary Allowances for use in Australia', together with the 'Dietary Targets for 1995 and 2000', provide the basis of food and nutrition policy and for strategies to improve the nutritional health of Australia (Better Health Commission, 1987 ).

Like many other countries, scientific bodies in Australia have developed recommendations for dietary intakes of nutrients which are considered necessary to maintain health. The Recommended Dietary Intakes (RDIs) for use in Australia was developed by the National Health and Medical Research Council. All RDIs are based upon estimates of requirements with a generous "safety factor" added. The definition of the RDIs in Australia has been generally accepted as: " Recommended dietary intakes (RDIs) are the levels of intakes of essential nutrients, considered in the judgement of the National Health and Medical Research Council, on the basis of available scientific knowledge, to meet the known nutritional needs of practically all healthy persons. The

RDI's are derived from estimates of requirements for each age/sex category and incorporate generous factors to accommodate variations in absorption and metabolism. They therefore apply to group needs. RDI's exceed the actual nutrient requirements of practically all healthy persons and are not synonymous with requirements." ( Truswell et al., 1990).

Increasing levels of fat, sugar and salt and decreasing levels of complex carbohydrate and fibre in the diet have been associated with increased morbidity and mortality from a range of chronic diseases and other health disorders (Baghurst & Record, 1983). The Better Health Commission concluded that the chronic diseases that were the major cause of death in Australia - coronary heart disease, stroke, cancers, Type 2 diabetes, cirrhosis of the liver, gall-bladder disease, and so on - were influenced to a greater or lesser extent by the same lifestyle factors of diet, smoking and physical inactivity (Better Health Commission, 1987).

A major nutritional and health concern has become the over-consumption of foods in the population - coupled with inadequate intakes of some nutrients in some population groups. In a national survey of Australian adults, 43 percent of men and 35 percent of women were overweight or obese ( Commonwealth Department of Health, 1987). Data available from the same survey indicated that in terms of current nutritional recommendations, the Australian diet was excessive in fat, refined carbohydrates and alcohol, and inadequate in complex carbohydrates and dietary fibre. Intakes of iron and calcium were particularly inadequate in some sub-groups compared to the recommended intake amounts.

In the same national survey, contributions of protein and fat to total energy intakes were higher than the suggested Dietary Goals ( Baghurst and Record, 1983; Commonwealth of Australia, 1987).

## 2.2 Young People and Nutrition

Most university or tertiary students are at a very important stage which may positively or negatively influence the health of their latter lives. Because this period represents a change from adolescent-hood to adult-hood, it is useful to look at the characteristics of adolescence.

Whilst there is no universally accepted age range representing the period of adolescence, the World Health Organisation (WHO) has chosen the 10 to 19 years age (Bennett, 1984). During adolescence, the linear spurt contributes about 15 percent to final adult height, 50 percent to adult weight, and adolescents gain 50 percent of their skeletal mass (Neinstein, 1984; Elizabeth and Felix, 1988). Teenagers also have a profound desire to exert their independence and make their own decisions. Food choice is likely to be one of the first targets (Lois and Gail, 1986). Thus adolescence is a critical stage from a nutritional viewpoint and many studies have focused on the food habits of adolescents.

Previous studies have identified adolescents as a population group to be at increased risk of nutritional deficiency and related disorders (Better Health Commission, 1987). A major concern is the prevalence of underweight, especially in girls, which in an increasing number of teenagers is a result of eating disorders. Peer pressure and susceptibility to media advertising are among factors identified as associated with eating disorders. The social attitudes toward the body, the overwhelming emphasis on beauty in our society and our preoccupation with appearance have caused mild forms of body image disturbance in non-obese individuals (Bruch, 1973). Kaufman et al (1974) have suggested that one's body image is the primary basis for modifying one's diet to lose or gain weight.

At the same time, the precursors of nutritionally-related adult disease are established during this stage. Precursors of coronary heart disease such as obesity, smoking, hypertension and hypercholesterolaemia also have been found to be present in this group. According to studies in New South Wales and Victoria, 33 percent of high school students were overweight or obese, 9 percent of girls and 4 percent of boys were 20 percent or more overweight (Court, 1988).

University students are at a stage which follows a period of growth acceleration and rapid body change that has rendered adolescents more vulnerable to nutritional deficits. It is also a time of change to adult behaviour and most behaviours developed during this stage are likely to be maintained in their latter life (Bennett, 1984). It has become increasingly apparent that the origins of some diet-related diseases occur early in life and that the most effective prevention measures are likely to be those aimed at younger age groups. A time when food habits and other lifestyle variables have not become fixed. Some of these studies have attempted to establish the interrelationships between dietary variables and certain diseases. Baghurst et al. (1980) found positive association between dietary variables (such as total energy, percentage of energy from carbohydrate, protein and total fat intakes) and risk factor status of coronary heart disease in a group of undergraduate students in Australia. Another study in the United States (Slattery, et al., 1990) investigated the food-consumption trends between adolescent and adult years and subsequent risk of prostate cancer. Their results indicated that during the adolescent years diet may function as a tumour initiator whereas during the adult years dietary intake may promote tumour development.

Thus, greater understanding of young people's food habits and dietary intake might be useful for studies of certain diet-related diseases and to plan nutrition education for this group to improve their health.

### 2.3 Eating Habits / Patterns / Behaviours

The variations in times and places of eating and the social functions of meals comprise the eating pattern. Dietary practices or food habits are defined as the recurrent performances of food related behavioural sequences by which an individual or group selects, prepares or consumes food, directly or indirectly, as a part of cultural, social and religious practices (Diehl and Leitzmann, 1985).

Food habits have many determinants. It has been considered that there is in operation individual variations of personality and psychological make-up, of attitudes, knowledge and belief about food, nutrition and health (Murcott, 1985). Food selection reflects the responses to social stresses, cultural pressures, educational and other personal factors, and environmental factors. When food is available in the market and economically accessible to the choice-maker, other independent variables, such as satiety, tolerance, taste, familiarity, health belief, price, convenience, prestige and knowledge, are the food selection determinants (Reaburn et al., 1979). Figure 1 is the model for food selection designed by Reaburn et al.

**Table 2.1 Food Selection Determinants**

(Reaburn et al., 1979)

Independent Variables		Dependent Variables
foods available	1. satiety 2. tolerance 3. taste 4. familiarity 5. health belief 6. price 7. convenience 8. prestige 9. knowledge	foods selected

Key features of adolescent eating behaviour have been defined by Truswell & Darnton-Hill (1981) as indicated in Table 1. Many of these can be associated with the need to express freedom from parental control and adoption of what are perceived to be adult tastes and life-styles.

Results of a study of adolescents in Europe, North America and Australia (Truswell & Darnton-Hill, 1981) also reported that eating habits were characterized by missed meals, “snacking”, a fondness for fast and take-away foods, the eating of unconventional meals, the questioning of parents’ nutritional values, and the consumption of alcohol and soft drinks.

**Table 2.2 Key Features of Adolescent Eating Behaviour**  
(Truswell & Darnton-Hill, 1981)

Characteristics of Eating Behaviour	
-----	
Changing meal patterns:	
	Skipping meals
	Snacking,
	Consumption of Sweets
Changing food consumption:	
	Unconventional meals
	Fast foods
	Alcohol
	Coffee
	Likes and dislikes of foods
Concern with body-weight:	
	Appearance

Descriptive food consumption surveys revealed that there are differences in the average energy and / or nutrient intake of age groups, social classes, males and females and ethnic groups. Evidence suggest that there are common patterns in tastes of adolescents or young adults, as well as infants and children..

A study was conducted in 1966-1967 on tastes of 50,000 students in 200 colleges in America (Einstein & Hornstein, 1970). Results were compared to those from studies carried out by the American army in 1960 (Peryam, 1960; Pilgrim, 1961). Food most often liked by young army men as well as students included: ice cream, roast turkey, soft rolls, fried chicken, steak, a series of desserts, French fried potatoes and milk. This list included animal proteins, sweet tasting foods but no fruits or vegetables (except fried potato chips).

In Australia, a survey was done on Australians' food beliefs and behaviours, in which results suggested that young people (18-30 years) believed their diets tended to be artificial rather than natural, too processed, unhealthy and deficient in vitamins and minerals (Worsley, 1989). They also were more likely to eat non-traditional foods. Their diets appeared to be composed more of snack foods than of fruits or meat.

Baghurst and Record (1983) have collected dietary data over four years, from various Australian subpopulations as an integral part of a number of behavioural studies. The study showed a high degree of consistency with a lower than recommended total energy intake in younger age groups.

College students as a big group in the population of young people, have their food consumption patterns which are of concern to nutritionists. These patterns are



similar with those of adolescent's, including the tendencies of students to skip meals, snack, follow extremely low-kilojoule diets and to avoid certain types of nutritious foods ( Stasch, 1970; Jakobovits et al., 1977; Khan and Lipke, 1982; Hernon et al., 1986).

Several factors have been identified related to those practices, such as gender, age, body weight, body-image perceptions, academic major, where they live, past training previous food experiences / patterns established prior to attending college, length of time in college and subscription to a meal plan (O'Leary and Lee, 1975; Gottschalk et al., 1977; Jakobovits et al., 1977; Vickery et al., Miller et al., 1980; 1985; Hernon et al., 1986; Beerman, 1991).

How can changes in life styles and eating habits influence the nutrient intakes of students? College students are living away from home and are generally occupied with academic work or involved with extracurricular activities. They may have changed their accommodation environment, changed their time schedules of daily life, have a limited budget, or experience stresses of academic demands and relationships with friends. All of these upheavals should be considered when studying the dietary practices of this group.

Many studies have been undertaken on different aspects of the food intakes of university students. Some researchers have suggested that low activity levels may lead to low energy intake among university students, while many investigations have also been done on the nutrient intake of the students. Most of these results were consistent, highlighting low intakes of calcium, iron, and folacin ( Ostrom and Labuza, 1977; Jakobovits et al., 1977; Driskell et al., 1979; Nowak, et al., 1988; Worthington, et al., 1988; Hoffman, 1989).

Food practices of young adults reflect past habits and may very well represent practices which will, in turn, be passed onto a new generation (Stasch, 1970). University or tertiary students, as well as adolescents, are among the target groups identified by nutrition educators and basic nutrition education courses are available in many tertiary institutions in Australia (Health For All Committee, 1989).

## **2.4 Culture and Food Habits**

In social science, the term culture has been used to refer to the values, knowledge, beliefs and behaviours that are transmitted from generation to generation and that characterise a particular society. It includes all those aspects of human life that are learned and shared by members of a society (Riddell, 1989).

Food habits vary from one cultural group to another. Riddell (1989) explained that as each group evolves it sets up its own complex pattern of standardized behaviours. Individuals within a culture behave in ways that are approved by the group. They select, consume and use those foods that are available to them. For example, many Asian people have a traditional disgust towards milk products such as cheese or yoghurt (Goodman, 1980). Food habits with real meaning are long lasting; they are not easily changed.

A study has investigated the dietary habits of some elderly Chinese women living in American (Chan, 1990). A significant positive association was found between frequency of consumption of selected American foods and the subjects English reading ability and education level. A study by Yang (1979) found that the longer the Chinese had lived in USA, the greater the changes in their food habits.

For those overseas students in Australia, while they are learning a new language and adapting to different types of people, food may be in a unique position that both links them with their mother culture and provides a chance for total relaxation and enjoyment. After studying the food habit changes of Chinese persons living in Lincoln, Yang (1979) suggested that complete abandonment of native food habits is unlikely. It was concluded that food habit did change. Cultural or subcultural background must be recognized and emphasized as an important determinant of dietary habits.

In recent years, the University of Wollongong has around 10 percent of students from overseas. Investigations of their adoption of Australian foods and the factors related to the ease of change may be useful, especially as it may relate to their academic performance.

## **2.5 Methods of Assessing Dietary Intake**

To study the dietary intake of an individual, it is necessary to be able to determine both types and amounts of food consumed and specific nutrients in that food. In general, individual dietary data may be collected by recording present intake or recalling past intake, while Gibson (1990) classified two major groups of methods according to quantitative or non-quantitative: (1) quantitative dietary consumption methods - consist of recalls or records, designed to measure the quantity of the individual foods consumed over a set period; (2) dietary history and the food frequency questionnaire, both obtain information on the patterns of food use during a longer, less precisely defined past time period. Twenty-four-hour recall, estimated food records and weighed food records are within the first, quantitative methods.

In the 24-hour recall participants are asked to describe the amounts and types of food and beverages consumed during the preceding twenty-four hours. Estimation of

the quantities and nutrients eaten can be obtained through the analysis of this information. A single 24-hour recall is most appropriate for assessing average intakes of foods and nutrients for large groups, except for persons with poor memories (e.g. some elderly persons), and young children (Young, 1981; Gibson, 1990). Gibson (1990) also concluded that the method is less time consuming, easier to administer, relatively inexpensive and has a low respondent burden so that compliance is high. Because it is retrospective, it is less likely to distort "usual" eating pattern than the record methods (Marr, J.W., 1977). A single 24-hour recall is likely to omit foods consumed infrequently. Its success depends on : the subject's memory, the ability of the respondent to convey accurate estimates of portion sizes consumed, the degree of motivation of the respondent, and the persistence of the interviewer (Acheson et al., 1980). Seasonal factors are a limitation, because this method only studies certain days and in some places during that season, not all foods are readily available. The day of the week effect and day to day variation also exist in the 24-hour recall method (Widdowson, 1947).

Some studies have shown that the absolute intakes of energy, protein, total fat, total carbohydrate and other nutrients obtained were similar by using diet frequency method, 24-hour food diary and 24-hour recall of food intake (U.S. Department of Health, Education and Welfare, 1979; Woodward, et al., 1981; Baghurst & Record, 1983 ).

Amongst studies of college students, this method has been used to study snacking, other eating patterns and nutrient intakes (Khan & Lipke, 1982).

A study of interrelationships between dietary intake, dietary knowledge and coronary heart disease risk factors in 350 undergraduate students in Adelaide (Baghurst, et al., 1980), used a seven-day recall format, together with a frequency format to collect dietary intake information.

In order to evaluate the nutritional status of American college-age students, the 24 hour recall method was used and followed by consecutive two-day food records. Food models and cross-checking were done to ascertain the data (Driskell, et al., 1979).

Data from the 24-hour recall have been reported to give approximately the same estimates for mean nutrient intakes of population groups as those obtained by seven-day records ( Young, et al., 1952; Chalmers, 1952; Beal, 1967).

The food record method is the most commonly used one among the reports of the research on food practises of college-age students. It is the record of all food and beverages as eaten (including snacks) , over periods from one to seven days. Quantities are estimated in household measures and nutrient intakes calculated using food composition data. Under 75% of RDIs is considered as possibly insufficient for an individual, allowing for the safety margin within the calculation of the RDIs ( Guthrie, 1986 & Hoffman, 1989). Accuracy depends on conscientiousness of the subject and their ability to estimate quantities. Longer time frames result in a higher respondent burden and lower co-operation (Gibson, 1990).

Some examples of the food record methods used on university campuses include:

- The Seven-day diet survey of 375 college students in Minnesota ( Ostrom and Labuza, 1977).
- Beerman's (1991) investigation on the variation in nutrient intake of college students compared by residence.
- Hoffman"s (1989) study of dietary intake of calcium, iron, folacin, alcohol, and fat for college students in central Michigan.

- The study of eating habits and nutrient intakes of college women over a thirty-year period in Cornell University (Jakobovits, et al., 1977).
- The study of eating patterns and weight concerns of college women (2 weekdays' and 1 weekend day's diet records) by Bailey and Goldberg (1989).
- A 3-day food record to obtain data of nutrient intakes and foods selected by college students (Hernon, et al., 1986).

A weighed food record records the weight of all food consumed over a defined period. It is accurate but time consuming. Condition must permit weighing to occur. Subjects may change their usual eating pattern to simplify the weighing process or to impress the investigator. It is expensive and requires literate, motivated and willing participants (Gibson, 1990).

A food frequency questionnaire uses a comprehensive list of foods or a list of specific food items to record intakes over a given period (day, week, month, year). It can identify food patterns associated with inadequate intakes of specific nutrients. The method is rapid with low respondent burden and high response rate but accuracy is lower than other methods.

Food frequency questionnaires have been used to study college students' food preferences or food and drink liked or disliked by them (Stasch, 1970; Schott, 1972). It also has been used with 24-hour recall, such as in a survey on dietary changes after studying a college basic nutrition course (Mitchell, 1990). A questionnaire including food frequency items, most of which were thought to be lacking in the diets of many college students. It was found that the food intake responses corresponded highly to the results of the 24-hour dietary recalls.

Obviously, a weighed food record is the most accurate way of assessing dietary intakes. But as indicated above, it has its limitation. It is impossible to apply

this method without much time, research budget and equipment for weighing foods, especially with limited numbers of motivated and willing participants. A food record method estimates the quantities of the food being consumed. As a prospective method, its accuracy depends on the subject's conscientiousness and their ability to estimate quantities. A food frequency questionnaire is commonly used when researchers study the dietary practices of university students, sometimes together with a 24-hour recall format. However, studies found that the food intake responses from the food frequency questionnaire corresponded highly to the 24-hour dietary recall in university students samples (Mitchell, 1990). The 24-hour recall method is the only retrospective method among the quantitative studies. It is less likely to distort the "usual" eating pattern. It has a low respondent burden. Studies also have found that data from 24-hour recalls gave approximately the same estimates for mean nutrient intakes of university groups as those obtained by food records (Young, et al., 1952; Chalmers, 1952; Beal, 1967).

## **2.6 Conclusions**

Adequate nutrition for the whole population has been one of the targets of many countries to improve the health of the nations. Food practices of young adults may be an important way to influence a new generation (Stasch, 1970). Thus university or tertiary students are among the target groups for nutrition educators. Studies have been done to investigate the food practices of this population and many factors have been identified related to those practices. Examples of these factors include gender, age, body weight, body-image perceptions, academic major, where they live, past training previous food experiences / patterns established prior to attending college and the length of time in college. As studies have shown that students' residence may affect their dietary practices, similar data on this group in Wollongong University may be useful to both students and the nutrition educators. It may also provide information to the university residence to improve their provision of food services to the students.

Of the many methods used to study dietary intake, 24-hour recall was used in this study because compared to other methods, it is less time consuming, easier to administer and relatively inexpensive. A high compliance was expected due to the low respondent burden of this method. The bias from the subject's memory, as a limitation of the 24-hour recall, may be lower in the university students compared to other groups such as elderly persons and young children.



## **CHAPTER 3      METHODS**

### **3.1      Methods**

The study was conducted in one of the collegiate accommodation facilities of the University of Wollongong, Weerona College, in the spring of 1991. A written questionnaire was developed and handed to all of the 191 students living in this college.

#### **(1)   Subjects**

The sample population included all students in the Weerona College in August 1991. At this time there were 186 students living in the college, comprising 57 international students and 130 Australian students.

#### **(2)   The Questionnaire**

There were two parts in the questionnaire. The first part was designed to collect information about eating patterns, such as the frequency of meals and snacks, the usual food and beverage consumed between regular meals, the frequency and reason for skipping meals and the way in which the students prepared their meals when food was not provided by the college. This section also sought information on age, sex and other demographics, as well as the students' attitudes towards their diet, the problems they had experienced such as budgetary, time management, food, climate, language and study technique, and comments on the food services provided by the college.

The second part of the questionnaire was used to collect dietary data in the form of a 24-hour recall. This part was optional. Students were encouraged to complete this section by offering to provide to them a computer based assessment of their diets.

The students were asked to list each item consumed; the time and place of consumption; brand / commercial name, if it was applicable; quantity consumed; and the method of preparation. The usual consumption of alcohol and of vitamin and mineral supplements also was requested. Examples of the recall were demonstrated. At the end of questionnaire, questions were used to double check the information by the students, such as " Have you included all drinks, including alcohol ?" " Have you included all snacks? e.g. chocolate, nuts, chewing gum, drinks, etcetera." Use of seasonings, sweeteners or other condiments were checked. (Appendix A, Page 4).

Three types of questions were used: (a) multiple choice items, where students chose among a number of propositions; (b) scales of values, where students indicated a value on a Likert or preference scale for each item; and (c) open-ended questions.

### **(3) Procedures**

#### **a. Pilot Study**

The questionnaire and the 24-hour recall were pre-tested with the students living in another college of the University, the International House. Seventeen students were included in the pilot study, including students of the nationalities also present in Weerona College. The acceptability of the length and format were assessed. The students also identified some difficulties in understanding the questions.

## b. Administration of the Questionnaire

The protocol used in this study was approved by the University of Wollongong Human Experimentation Ethics Committee.

The Weerona College approved the survey. A letter from the Head of College was sent to the students together with the questionnaire. The Weerona College Office also helped to administer and collect the questionnaire. Every student in the college received a self-administered questionnaire in their room (a questionnaire was left under the door of the room if the student was not present). The purpose of the study was explained to the subjects in the introduction section of the questionnaire. Participation was entirely voluntary. The students were told that their identities would be safeguarded and only group data would be reported in the final result. Those who completed the questionnaire returned it to the college office individually. There were two reminders on the notice board of the college within 7 weeks.

## 3.2 Data Analysis

Information was coded so that it could be transferred directly to a computer. Frequencies, cross-tabulations and statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS) (Norusis, 1990). The dietary recall information was processed with the Diet -1 computer package (Xyris Software, 1988 - 1991).

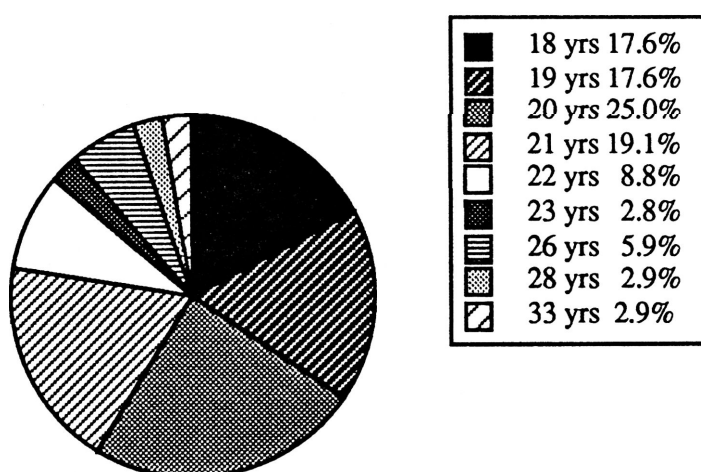
## CHAPTER 4 RESULTS

In total 186 questionnaires were administered, with 68 returned by the students ( 37 percent return rate ). Among them, sixteen students from the college participated in the 24-hour dietary recall. The number of the valid completed dietary recalls which were analysed was 15.

### 4.1 The Subjects

Ages of the respondents ranged from 18 to 33 years with a mean age of 20 years. The distribution of the ages is presented as Figure 4.1.

**Figure 4.1 Percentages of Students in Different Age Groups**



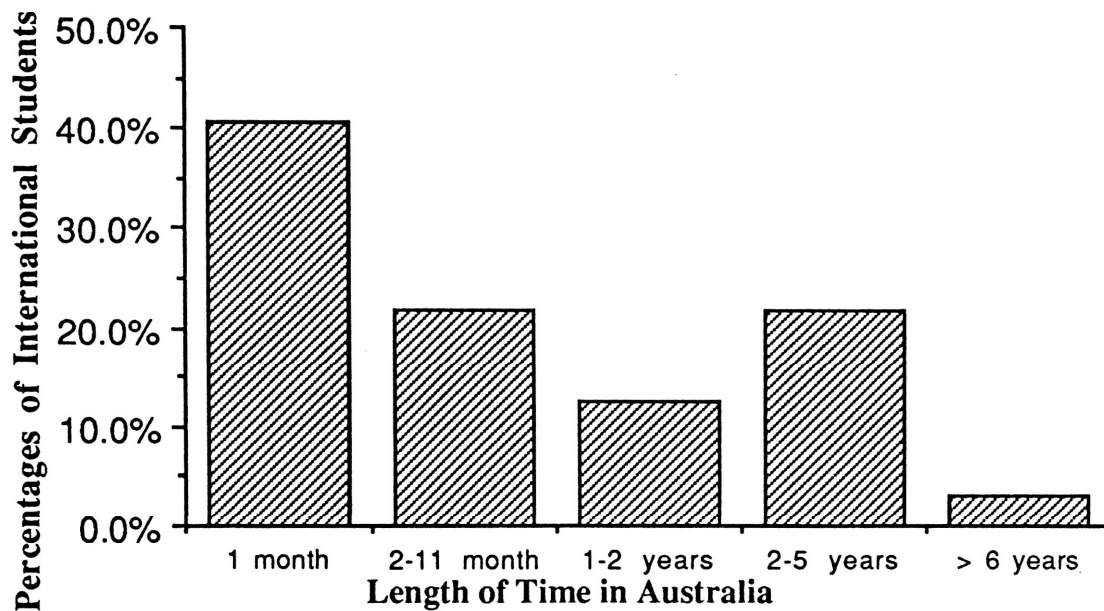
The subjects included 35 ( 51.5 percent ) female and 33 ( 48.5 percent ) male students. Among the 32 international students respondents, 25 (36.8 percent) were from Asian countries, with the rest from the United States, as shown in Table 4.1. The percentage of international respondents among the total subjects was 47.1 percent. This was higher than the percentage of international students in the college ( 35.5 percent).

**Table 4.1 The Numbers of Students from Different Countries**

Countries	Student Numbers	%	Respondents	%
Asian	49	26.3	25	36.8
USA	11	6	7	10.3
others	6	3.2	0	0
<hr/>				
International students	66	35.5	32	47.1
Australia	120	64.5	36	52.9
<hr/>				
Total	186	100	68	100

The length of time the international students had been in Australia varied widely, with 40 percent reporting stays of one month or less when this study was conducted. Figure 4.2 illustrates as percentages, the different length of stay of students in Australia.

**Figure 4.2                      International Students' Stay Length in Australia,  
Expressed as a Percentage**



The majority of the students were studying undergraduate courses. Table 4.2 lists the number of students enrolled in the different courses. The "others" included foundation studies and language courses.

**Table 4.2 Level of Courses Enrolled in**

Courses	Student Numbers	Percent ( % )
Undergraduate	60	88.2
Master	4	5.9
Ph.D	2	2.9
Others	2	2.9
Total	68	100

Only one student was married.

## **4.2 Dietary Practices**

### **a. Frequencies of Meal and Snack Consumption**

In the first part of questionnaire, the students were asked how frequently different meals and snacks were consumed each week. The results indicated that breakfast was the most often skipped meal. The average frequency of breakfast consumption by students per week was 5.5 times, varying from 0 to 7 times per week. Table 4.3 shows the frequencies of meal and snack consumption, with the minimum and maximum times per week. It also includes a comparison between males and females.

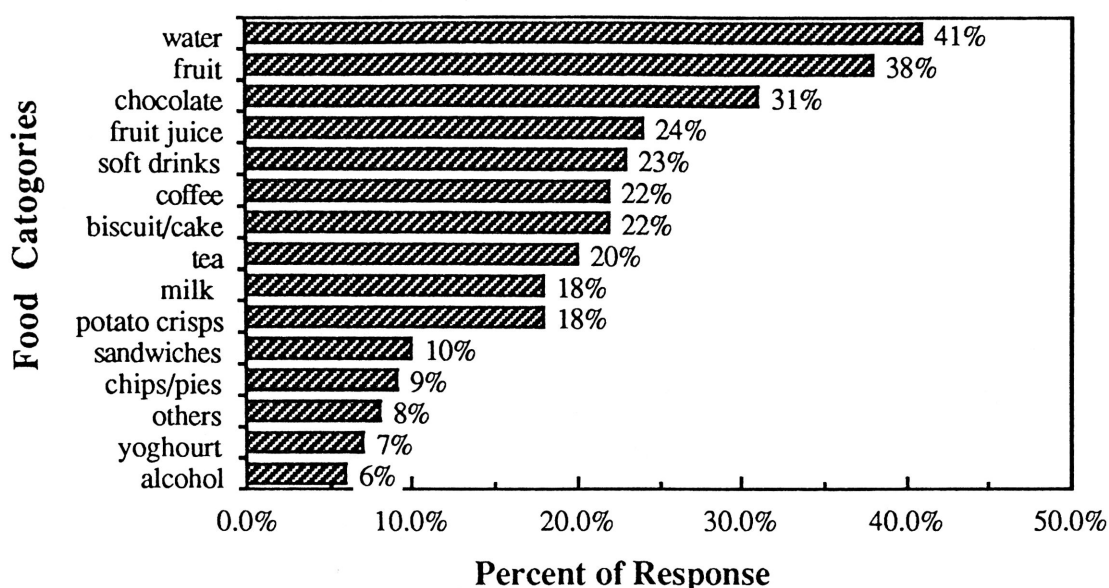
**Table 4.3 Gender comparisons of Frequencies of Meal and Snack Consumption**

	Average Times of Meals and Snacks per Week		
	-----		
	Female ( n = 35 )	Male ( n = 33 )	All Students ( n = 68 )
Breakfast	5.1	5.9	5.5 ( range: 0 - 7)
Lunch	5.7	6.2	5.9 ( range: 0 - 7)
Dinner	6.7	6.9	6.5 ( range: 0 - 7)
Snack	9.6	4.2	6.9 (range: 0 - 21)

#### **b. Snack Categories**

The students were asked to indicate the main snack items they usually consumed. Water, fruit and chocolate were reported as the most common snacks; 41 percent, 38 percent and 31 percent of the students respectively reported these food categories as their snacks. This was followed by fruit juice (24 percent), soft drinks (23 percent) and biscuit / cakes ( 22 percent). Milk, coffee, tea, and potato crisps were also important snacks for the students (refer to Figure 4.3 ). Fruit and chocolate were the foods selected most often as snack; while within beverages, the most often ones were water, fruit juice and soft drinks.



**Figure 4.3** Frequencies of Foods Chosen as Snacks

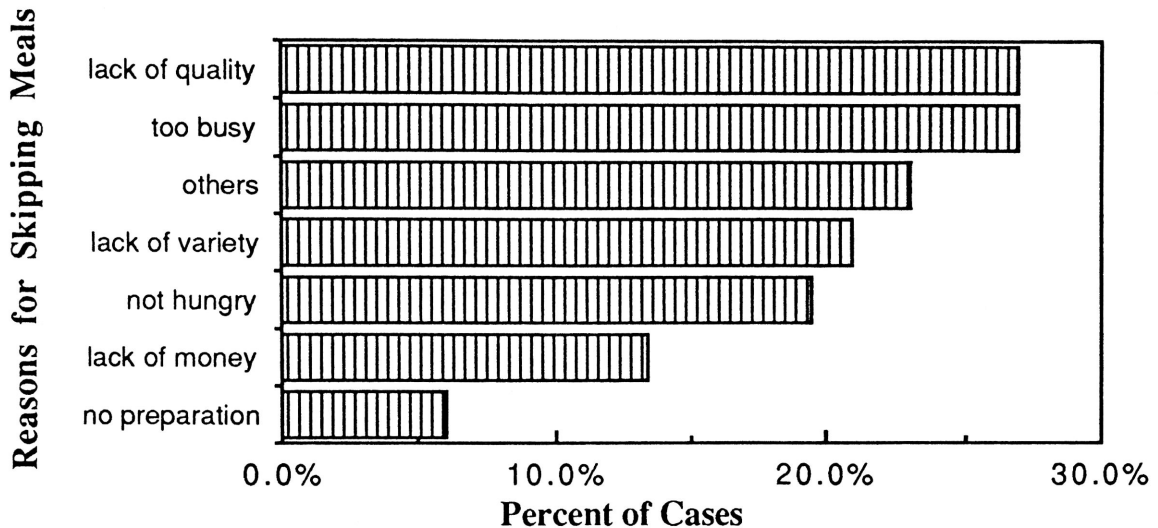
The five most commonly consumed snacks by female students were fruit, water, chocolate, biscuits / cakes and fruit juice. For males, the top five snacks were water, milk, chocolate, fruit and potato crisps. Alcohol was identified as a snack by only 2.2 percent of female and 3.9 percent of male respondents. When a comparison was done between overseas students and Australian students, the 5 most common snacks in both groups all included water, fruit, chocolate and fruit juice, except that milk is also common for Australian students instead of biscuits for overseas students.

### **c. Reasons for Skipping Meals**

Students were asked to indicate that if they skipped meals, what was the most important reason (refer to question 19, Appendix A). Fifty-five (81 percent) of the students, including 82.9 percent of females and 78.9 percent males, reported that they skipped meals. Contained in Figure 4.4 are reasons for skipping meals and the percentages of students choosing each reason. "Lack of quality of food (by the

college)" and "too busy" were the too main reasons. The "other" mainly included dislike or lack of quantities of food provided by the college.

**Figure 4.4 Reasons for Skipping Meals and Frequencies Reported**



#### **d. Food Services Used by the Students**

In the first part of the questionnaire, questions 17, 18 and 22 were dealing with the food services used by students. During the time when students were around the University, even though the college provided sandwiches, 76.5 percent of students reported their lunches were from university union / canteen. Less than 3 percent students had the sandwiches provided by the college. Table 4.4 shows the details of food services or facilities used by the students.

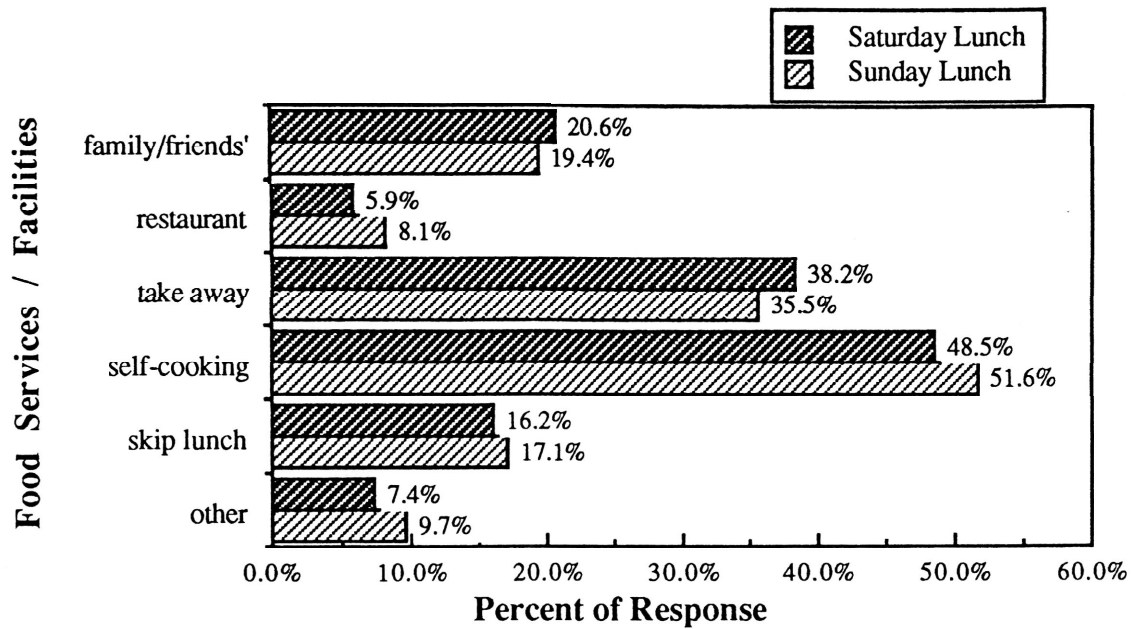
Female students did more cooking for themselves than males ( 44.1 percent versus 6.1 percent). Overseas students also did more cooking than the Australian group (43.8 percent versus 28.6 percent). But Australian students consumed more take away foods, with 54.3 percents compared to the 28.1 percent of overseas students.

**Table 4.4    Percent of Usage of Different Food Services or Facilities**

<u>Food Services or Facilities</u>		
When away from university		When in university
-----		
--	union / canteen	76.5%
41.8%	take away	16.2%
17.9%	restaurant	1.5%
31.3%	family cooking	13.2%
35.8%	self-cooking	17.6%
3%	others	1.5%

Lunches on the weekend were usually not provided by the college. Self-cooking and take away foods were the most common way in which students obtained their weekend lunch. The rates of skipping lunch on Saturday and Sunday were 16.2 and 17.1 percent respectively ( refer to Figure 4.5 ).

**Figure 4.5 Ways in Which Students Prepared Weekend Lunches**

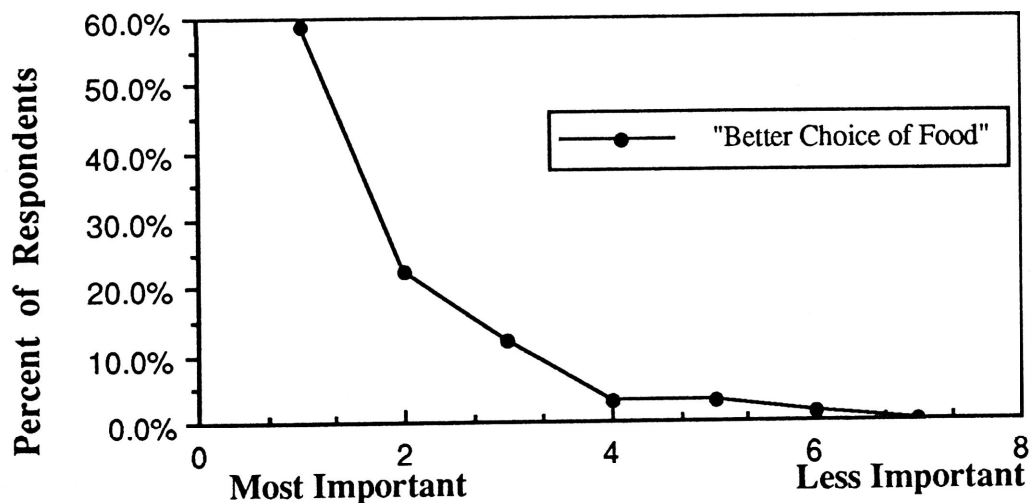


**Table 5 Percent of Usage of Food Facilities During Weekend**

<u>Food Facilities</u>			
Response Rate for Saturday		Response Rate for Sunday	
17.1%	skip lunch	16.2%	
51.6%	self-cooking	48.5%	
35.5%	take away	38.2%	
8.1%	restaurant	5.9%	
19.4%	family/friends'	20.6%	
9.7%	other	7.4%	

When the reasons for substituting college meals were requested, "better choice of food", "increase variety of food", "increase quantity of food", "convenience", "sociable", "for specific meals not provided by college" and "missed meal time at college" were listed. "Better choice of food" was selected by 58.8 percent of students as the most important and very important reason ( see Figure 4.6). While 54.6 percent males indicated "increase quantity of food" was the important reason for them to have meals other than the college ones. Among female students, 25.7 percent reported "missed meal time" was the most important reason. For overseas students, most of the responses were similar with those of Australian students, except that 34 percent of them went for foods outside the college for "specific meals not provided in college".

**Figure 4.6 Percent of Respondent Selecting "Better Choice of Food"**



### 4.3 Students' Attitudes to the College's Food Services

The degree of satisfaction of students to the college food services was sought and is summarized in Table 4.5.

**Table 4.5 Degree of Satisfaction for College Food Service**

Satisfaction Degrees	Ranked by Students	Percent of Response
"Very Good"	0	0
"Good"	8	11.8%
"Not Bad"	24	35.3%
"Poor"	25	36.8%
"Very Poor"	11	16.2%
Total	68	100%

The mean frequencies of meals consumed in the college by the students were 5.3 times per week for breakfast, 3.7 times for lunch and 5.8 times for dinner. From the comments on the the college food service given by the students, 67.6 percent of respondents expressed their concern about the ways for cooking foods in the college, such as requesting less deep fried foods, greasy foods, overcooked foods and recycle foods, and more fresh vegetables and fruits.

The percent of respondents recommending different ways to change the food service in the college are also listed in Table 4.6.

**Table 4.6 Students' Attitudes of Changing Food Services**

	Numbers of Respondents	% of Respondents
-----		
"Enhance Quantity"	32	47.1%
"Alternate Cooking Ways"	46	67.6%
"Change the Time When Meals Available"	12	17.6%
"Do Not Want to Change"	1	1.5%

"Enhance Quantity (of Food Provided)" was mainly expressed by the students as providing more certain foods, such as fresh vegetables and fruits, diet milk, and yoghurt, etcetera. While among male students, this was also generally expressed as demanding greater amount for foods provided. Fixed meal times was another concern by the students mainly due to their different individual time schedules relating to the classes in university. Lengthening the meal time was suggested by 17.6 percent of the respondents.

#### **4.4 Students' Diet-related Experiences**

From the answers of question 10, 44 ( 64.7 percent ) students had not been away from home before they came to Wollongong.

The answers for question 11 showed that 40 ( 58.8 percent) students had not involved in preparing the daily meals before they came to university. But more females (74.3 percent) involved in preparing foods before than males (42.4 percent). Comparison between age groups could not be done because of the small number of the subjects. The difference between the Australian group and the international group was not large ( 61.1 percent and 56.3 percent respectively).

When asked the different problems experienced, the respondents for each problem were listed at Table 4.7.

**Table 4.7 Problems Experienced by Students**

Problems	Student Numbers	Percentage
Financial Problem	26	38.2%
Climate	18	26.5%
Lack of Friends	8	11.8%
Foods	42	61.8
Time Management	23	33.8%
Study Technique	20	29.4%
Language	18	26.5%

Table 4.8 shows the difference between the Australian and overseas students group the problems they had experienced. The most responses were regarding the food and financial problem, by both groups. The frequencies of food-related problems, as well as climate and study technique unadaption, were expressed by overseas students was higher than Australian students.



**Table 4.8                      Problems Experienced by Students Expressed as  
Comparison between Australian and Overseas Groups**

Problems	Student Numbers		Percentage of Respondents	
	Australian	Overseas	Australian	Overseas
Financial Problem	15	11	53.6	37.9
Climate	1	17	3.6	58.6
Lack of Friends	3	5	10.7	17.2
Foods	16	26	57.1	89.7
Time Management	12	11	42.9	37.9
Study Technique	6	14	21.4	48.3
Language	0	18	0	62.1

#### **4.5    Nutrient Intakes**

There were 16 students from the college who participated in the 24-hour dietary recall, fifteen appropriately completed the record and the information was used for analysis. The mean age of these 15 respondents was 21.6 years (range from 18 to 33 years ). Six females and nine males completed this section of the questionnaire.

Eight cases indicated it was a typical day for their diet, and 5 reported they were taking vitamin or mineral supplements.

The dietary information was analysed with Statistical Package for the Social Sciences (SPSS) and the Diet - 1 (version 3) computer program ( Xyris Software, 1988-1991 ). The main reference used to determine reported nutrient intakes from this survey was the Recommended Dietary Intakes (RDIs) for use in Australia ( Truswell and Stewart, 1990). All RDIs are based upon estimates of requirements with a generous "safety factor" added.

Most of the cases met the RDIs for nutrients. The mean intakes of protein, retinol, vitamin.C, iron, zinc, potassium, calcium, phosphorus and magnesium, for all of these 15 students, were all over 100 percent of RDIs. All cases of protein intake in individuals were over 100 percent of RDIs, mainly distributed within 100 ~ 300 percent. The mean intake of Vitamin C was particular high - 586 percent of RDIs.

However, some of the participants had considerably low retinol and calcium intakes. Five of the 15 students, in both cases, had retinol and calcium intakes under 75% of RDIs (under 75% of RDIs was considered as possibly insufficient for an individual, allowing for the safety margin within the calculation of the RDIs) ( Guthrie, 1986 & Hoffman, 1989). Table 4.9 shows the mean nutrients expressed as percent of RDIs.

**Table 4.9 Mean Nutrients Expressed as Percent of RDIs**

Nutrients	Mean $\pm$ SD	Number of Cases ( n = 15 )			
		percent of RDIs			
		< 75%	75~100%	100~300%	>300%
Protein	222.6 $\pm$ 70.4	0	0	14	1
Retinol	176.4 $\pm$ 152	5	1	5	4
Vit.C	586.5 $\pm$ 362	1	0	4	10
Iron	257.5 $\pm$ 186	0	1	10	4
Zinc	132.4 $\pm$ 45.6	1	5	9	0
Potassium	215.5 $\pm$ 74.2	0	0	13	2
Calcium	124.3 $\pm$ 77	5	2	7	1
Phosphorus	186.9 $\pm$ 80	0	1	11	3
Magnesium	141.3 $\pm$ 64.0	1	5	9	0

The mean for the total energy intake was 12014.8 KJ, SD = 6443.6 KJ and ranged from 2499 to 30295 KJ. The percentages of energy derived from major nutrients were mainly in line with the recommended values. The mean mono & poly unsaturated fat : saturated fat ratio was close to the recommended ratio. Details are listed at Table 4.10.

**Table 4.10**                      **Average Percentages of Energy Derived from  
Major Nutrients - Comparison with  
Recommended Values\* (excluding alcohol)**

Components	Student Survey ( Average)	Recommended Ratio
<hr/>		
Protein (%)	17	12 - 15
Fat (%)	30.9	30
Mono + Poly Unsat. Fat (%)	16.6	20
Saturated Fat (%)	14.3	10
Mono & Poly Unsat. Fat : Sat. Fat	1.2 : 1	2 : 1
Carbohydrate (%)	52	55 - 60

\*Suggested U.S. Dietary Goals (Baghurst and Record, 1983).

The contributions of macronutrients to total energy intakes were also compared between subjects in this study and the similar age group in the 1983 National Dietary Survey in Australia (as in Table 4.11). In the present student survey, the contribution of protein to total energy is very close to that of the similar age group in the National Survey, with higher carbohydrate and lower fat and alcohol components in the student group.

**Table 4.11 Contributions of Macronutrients to Energy Intakes  
- Compared with the 1983 National Dietary Survey\***

Components	Present Student Survey	National Survey	
		Men ( 25 - 34 years )	Women
Protein ( % )	17	16.5	17.3
Fat	30.9	37.5	37.3
Carbohydrate	52	40.9	42.2
Alcohol	0.3	5	3

\*Commonwealth of Australia, 1987.

## CHAPTER 5                      DISCUSSION

The results of this study were from the 68 respondents of the total 186 residents living in the Weerona College of the University of Wollongong. All of the respondents were tertiary students. Sixteen students responded to both the questionnaire and the 24-hour dietary recall. The response rate was 37 percent. As there has not been a dietary study carried out in the College before, some students may have not had the experience for this kind of survey, this may be part of the reasons why we could not obtain a high response rate. At the time of this survey, all of the residents in the college were involved in the 1991 national population census. This may have partly influenced the response rate.

A higher response rate was obtained for the first part of the questionnaire than for the 24-hour recall. An explanation for this may be that the questionnaire was more directly related to the food service provided by the college, while the recall was to assess if the students were having a balanced diet. The students may have liked to express their opinions towards the food services rather than receive information on their individual dietary intakes. Examining the previous studies involving college students, most were carried out during class times, as a part of academic work for the nutrition related courses. This had achieved completion rates higher, as well as include students who were interested in nutrition and diet. the present study was more general and included subjects with a range of interests.

The Weerona survey also was designed to study other factors, such as different age groups, the time length in Australia of the international students, marital status and the course undertaken. Some of the comparisons could not been done due to the low response rate and the demographic characteristics of the sample. Most of the respondents were aged between 18 to 23 years. Too few respondents were over 25

years old. It was impossible to make comparison between age groups. All except one student were single. Of the 68 respondents, 60 (88.2 percent) were studying undergraduate courses. Forty percent of the overseas student respondents had arrived in Australia within 1 month. However, the total number of overseas students was too low to make meaningful comparisons within this group. Thus the results are mainly discussed as a whole group of the students living in the college.

### **5.1 Frequencies of Meals and Snacks Consumption**

In this Weerona study, the frequencies of meals and snack consumption ( 5.5 breakfast, 5.9 lunch, 6.5 dinner and 6.9 snacks per week ) were similar with a study of college students in United States (Bailey, S. & Goldberh, J.P., 1989). That study showed the meal frequencies of: 5.1 (breakfast), 5.6 (lunch), 6.7 (dinner) and 10.7 (snacks) per week by American female college students. It seemed that the breakfast was the most often skipped meal. This result agrees closely with an earlier report, which indicated 23.6 percent of students skipped breakfast (Khan & Lipke, 1982). Dinner was the least skipped meal, while lunch was skipped almost as often as breakfast. Jakobovits, etcetera (1977), reported that college women least often missed the evening meal but skipped lunch most.

The mean snacking frequency was 6.9 times per week. Thus, on average, the students had one snack every day. Other studies have identified that college students ate snacks 2.5 times per day in addition to meals (Khan & Lipke, 1982) and 5.14 times per day (Jakobovits, et al., 1977). In the present study, the frequencies of snacking varied widely between students. Some reported that they did not snack, while some consumed snacks up to 20 times per week.

In a random population survey which examined the general community's beliefs and attitudes toward dietary practices (Worsley, 1989), it was reported that in

the 18 - 30 years age group, there were 69 percent of respondents snacking between meals. These results suggest that snacking has become a way of life.

A difference in meal consumption frequencies was noted between different genders. Females students reported consuming more snacks than males (mean: 9.6 versus 4.2 times per week ).

The frequencies of meal consumption in this study were obtained from the estimation by the students. Therefore the accuracy was limited by the memory of the students and the way they distinguished "formal meals" and snacks. It could be compared with results obtained from the dietary recall to test its validity. But due to the low response rate for the dietary recall, this procedure have not been done.

## **5.2 Snack Categories**

When the snack categories were studied, water, fruit and chocolate were the three most common snacks, followed by fruit juice, soft drinks, biscuit/cakes, milk, coffee and tea. The result indicated that the students liked beverages as a snack more than other foods. This result agrees in part with a study which showed carbohydrate beverages were the most common snack among college students (Khan & Lipke, 1982).

The common snack items were a bit different between the Australian and overseas students group. Milk as a common snack for Australian respondents, was not included in the common snack list of the overseas students. This may reflect the difference in food preference of some students. Even though there were American students in the overseas students group, the rest were from Asian countries. More than 60 percent of the international students had been in Australia less than 2 years. A researcher who studied nutrition in Asia for 6 years, found that many Asians had a



traditional disgust towards milk products: to take cheese or yoghurt, or drink cow's milk had never been to their liking ( Goodman, 1980).

This study showed there was difference of food preference between Australian students and the students from other countries (mainly from Asian countries) in the specific college. However, they were not represent all the Australian and the overseas students populations. If the study could be done in a bigger size population (such as carried out in different accommodation facilities) to get a representative sample, and compared with the length of time being in Australia, the bias caused by the characteristics of the sample within each group may be reduced.

### **5.3 Frequencies of Skipping Meals**

Eighty-one percent students had the habit of skipping meals. "Lack of quality of the meals (provided by college )", "too busy", and "dislike or lack of quantity of foods" were the reasons given for skipping meals. This reflected the students' concern about the food provided by the college. It also may be due to the fixed hours of serving meals in the dining facilities at the college. Even though the college provided various foods every week (according to the menu from the college) and they provided certain quantities of different foods which they thought sufficient for all the students, the participation in family-style meals may encourage students to eat more regularly (this could be reflected from the 24-hour recall that most of nutrients intakes were well over 100 percent of recommended amounts). For those students who were late for the meal time or had missed the meal time, they described the meals as "lack of quality / variety", because there was not much of certain foods were left for them at that time. Many comments from the students for the college food service also mentioned that meal time (5.30 pm to 7 pm) was not long enough, even at 6.30 pm, some of foods (such as fresh vegetables and fruits) had all gone.

#### 5.4 Food Services Used by the Students

During the time when students were around the University, even though the college provided sandwiches, 76.5 percent of students reported their lunches were from a university union / canteen. Less than 3 percent students had the sandwiches provided by the college. Take away food outlets were the second most commonly used facility by the students following the university canteen.

Female students did more cooking for themselves than males ( 44.1 percent versus 6.1 percent). Overseas students also did more cooking than the Australian group (43.8 percent versus 28.6 percent). In contrast, Australian students consumed more take away foods, with 54.3 percent respondents compared to the 28.1 percent of overseas students purchasing such food.

Lunches on the weekend were not provided by the college, but breakfast and dinner were provided as usual. Self-cooking and take away foods were the most common way in which students obtained their weekend lunch. The rate of skipping lunch on Saturdays and Sundays were 16.2 and 17.1 percent respectively. The author have talked to the Head of the college and some students. They all agreed that not many students had consumed the weekend lunch provided by the college before these meals had been cancelled. The explanations given were that: some residents were away from the college during weekends; others slept in and just had a brunch; and the weekend lunch from the college was similar food to weekday ones (which were not liked by many students, with less than 3 percent of the respondents reporting to have consumed it). It was thus thought not necessary by the college to provide weekend lunches .

"Better choice of food" was selected by 58.8 percent of students as the most important and very important reason for eating alternatives to college meals. While

54.6 percent of males indicated "increase quantity of food" was the important reason for them to have meals other than the college ones. Among female students, 25.7 percent reported "missed meal time" was the most important reason. For overseas students, "specific meals not provided in college" was the important reason for 34 percent of this group. This response was supported by comments such as "provide more Asian style foods".

Since the study did not employ random sampling techniques, the sample may not be representative of all students living the college. Thus the opinions given only reflected those from the participants. In future study, a random sampling technique may help to obtain a representative population for college residents in all accommodation facilities.

### **5.5 Students' Attitudes on the College's Food Services**

Generally, the respondents were satisfied with the college food services. Even though nobody rated it as "very good", about half of the respondents described it was "good" and "not bad".

The concerns of the students on the food service concentrated on quantity, cooking methods and the meal time. More than 60 percent students agreed that the cooking methods in the college should change, especially "less deep fried food", "more fresh vegetables and fruits" and "less recycled and overcooked foods". "Enhance quantity (of food provided)" was commonly expressed by the students, meaning more of certain foods, such as fresh vegetables and fruits, skim milk and yoghurt. Among male students this also was generally expressed as demanding greater amount for foods provided. Fixed meal times was another concern by the students. Lengthening the meal time was suggested by 17.6 percent of the respondents.

However some students thought that the college provided a wide variety of foods. One student stated that he did not want any change in the college food services. The difference between the opinions of the students again might be caused by the difference in their individual time schedules in that they attended the meal at different time.

Again, a representative sample for all the college residents is needed in order to generalized the results form the study.

### **5.6 Students' Diet-related Experiences**

More than half ( 64.7 percent ) of the students had not been away from home before they came to Wollongong. And 40 ( 58.8 percent) students had not been involved in preparing the daily meals before they came to university. More females (74.3 percent) had been involved in preparing foods before than males (42.4 percent). The difference between the Australian group and the international group was not large ( 61.1 percent and 56.3 percent respectively). The results indicated that for many students attending university was an important transitional period from dependent to independent food selection. Females seemed more likely to prepare foods for themselves. This may relate to weight concerns. Such concern about weight and low meal frequency previously have been reported in some college women subpopulations ( Bailey et al., 1989).

### **5.7 Nutrient Intakes**

From the dietary recall information, most of the cases met the Recommended Dietary Intake (RDIs ) for major nutrients and key vitamins and minerals. The mean intakes of main nutrients were all over 100% RDIs. All cases of protein intake in

individuals were over 100 percent RDIs, mainly distributed within 100 ~ 300 percent RDIs. The mean intake of Vitamin C was particularly high - 586 percent RDIs.

These results indicated that the students were having dietary intakes which met or were even higher than the recommended amounts for most of nutrients. When compared to other subpopulations in the same age group, some influencing factors must be considered. The fact that the students paid a flat fee for their meals regardless of the amount of food consumed may encourage students to eat more. A similar effect has been reported by another study of college students ( Beerman, 1991). The nutrient intake of the students also varied widely. Such an uneven distribution among the students ( a high standard deviations for nutrients ) may affect the mean results. Finally the errors in self-reporting might have partly affected the results.

There were cases which had considerably low retinol and calcium intakes (33.3% of students in both cases had retinol and calcium intakes under 75 percent of RDIs - under 75% intakes of RDIs was considered as insufficient ) ( Guthrie, 1986 & Hoffman, 1989).

Previous studies also had found low intakes of calcium, iron and folacin among college students ( Wise, 1974; Jakobovits & Halstead et al. 1977; Worthington & Breskin et al.1988 ; Driskell & Keith, et al., 1979; and Nowak & Knudsen et al. 1988).

Eight cases indicated it was a typical day for their diet. Five students reported they were taking vitamin or mineral supplements.

A random population survey in Australia showed the 18-30 year group consumed less fresh fruit, less meat, more take away, fewer desserts, more pasta,

more novel foods, and fewer carrots and peas than most other groups (Worsley, 1989). This study also reported that 54% of women and 31% of men regularly took dietary supplements. This compared with 33 percent of the present study.

The contributions of macronutrients to total energy intake in the Weerona study showed that the percentage of these components in their diets were generally in line with the recommended amounts, although there was a little concern regarding the type and amount of fat consumed. The mean ratio of mono- and poly-unsaturated to saturated fats was 1.2 : 1 (the recommended ratio is 2 : 1). This ratio was varied widely between the respondents: there were 3 students had a ratio of greater than 2, 11 students' were 1.8 - 1.4, 1 student's was 1.7. This indicated the consumption of larger amount of animal fats in the students' diet. This may be partly supported by the students' concern about their "grease food" and "deep fried food".

When compared to the results of the similar age group in the 1983 National Dietary Survey, results in the present study were more in line with the recommended values. Contributions of alcohol and fat to total energy were lower in the college subjects and the contribution of carbohydrate was higher. Thus the results from this study suggested that this student subpopulation were having diets which were no worse than the others in the same age group. In general their nutritional intakes met the set recommendations.

## **5.8 Limitation of the Study**

The sample of this study was not big enough (due to the low response rate) and lacked a control group for comparison, it did not employ random sampling techniques either. Because of the limited time and research resources, it was impossible to carry out the survey in another college population or those not living in college accommodation. The residence characteristics of different colleges also affects

the dietary practice and nutrient intake (Beerman, 1991). Therefore, the sample may not be representative of all students living in colleges of the University of Wollongong.

The questionnaire was self-produced. Even though consultation had been made to relevant people such as the people who supervised this project, the statistics consultant and the management officers in Weerona College, and pre-testing had been done on a small population in another college, reliability of the questionnaire had not been tested. The validity of this study also was not tested.

The results, especially those from the 24-hour recall, may have included errors in self-reporting as well as idiosyncratic individual eating behavior or intervening unmeasured variables, particularly portion size. Because most of the students had not participated similar survey before, a participant training effect may exist in this study.

A limitation of the 24-hour recall was that not every respondent reported their typical days' intake. The day of the week effect and day to day variation had been found in the 24 hour recall method (Widdowson, 1947) with Sunday intakes being higher than weekday intakes. Thus this study might not reflect the actual nutritional intakes of the students. Factors influencing the day to day variation in dietary intake have been identified by Widdowson. These include the previous day's intake, serving of food which is liked or disliked, physical activity, variation in emotional state, variation in health and day of the week.

The fact that the students paid a flat fee for their meals regardless of the amount of food consumed may encourage students to eat more. Such an effect has been reported in another study of college students (Beerman, 1991). Even more, because the nutrient intake of the students varied widely, the uneven distribution (including sex

difference) among students ( the standard deviations for nutrients ) may affect the mean results.

Most of the work of this study such as data collecting, interpreting and recording the information was done by the author. This would reduce the bias caused by person to person difference when processing the data. Even so, bias may still exist, especially on the interpreting the information such as the comments from the students.

In order to further understand the food practices and the ease factors to help students adapt the new social and academic environments, hence to live happily and healthily, and to work effectively and efficiently, more studies need to be done to investigate the differences of the dietary practices of students living in different accommodation, especially to compare those living in non-collegiate and college accommodations.

## **5.9 Recommendations for the Students and the College**

Analysis of the 24-hour recall dietary information have been sent to the respondents individually, including the out-put of the recall information from the computer program. A letter was also attached to explain the results from the computer, giving suggestions for increasing or decreasing certain foods to achieve a better diet for each individual. Some basic nutrition information was also given in the letter.

Based on the results of this study, some recommendations have been made to the college for the food provision in the future. These include:

- (1) Alternate cooking methods frequently to meet the different needs of the students;



- (2) Lengthen meal times, especially the dinner time, or keep foods for those students late for meals ( as a result of late classes) individually;
- (3) More accurate assessment of the amount of food consumed by the students, avoid waste and recycling of foods;
- (4) Provide larger amounts of foods which are healthier and liked by many students, such as different types of fresh vegetables and fruits, dairy products such as low fat milk and low fat yoghurt.

## CHAPTER 6 CONCLUSION

For many students, starting university also means living away from home. Thus it is a transitional period between living with parents and living independently. New responsibilities, including food decisions are faced by many students. Poor food habits during this stage can result in serious consequences that can be further aggravated by physical stress and emotional problems. As previous studies have indicated, student's residence not only affects food selection but also significantly influences nutrient intake (Beerman, 1990, 1991). Thus, study of the food habits and dietary intake of students living in the University of Wollongong accommodation would be useful to provide a profile of the students living in the residence to make an overall judgement on their diets and to determine the appropriateness and the need for improvement of the college food services.

The results of this study indicated that breakfast was the most often skipped meal by the students (the mean frequency of eating breakfast was 5.5 times per week, ranged from 0 to 7 times). "Lack of quality of food" and "too busy" were the two main reasons. Water, fruit and chocolate were reported as the most common snacks; followed by fruit juice, soft drinks and biscuit / cakes. The mean intakes of protein, retinol, vitamin C, iron, zinc, potassium, calcium, phosphorus and magnesium were all over 100 percent of the Recommended Dietary Intakes (RDIs) for use in Australia, with particularly high protein and vitamin C intakes. Some of the participants had considerably low retinol and calcium intakes. The nutrient intakes of the students were found to vary widely. However these results might include the errors in self-reporting.

More than half ( 64.7 percent ) of the students had not been away from home before they came to Wollongong. And 58.8 percent students had not been involved in preparing the daily meals before they came to university. The results indicated that for many students attending university was an important transitional period from dependent to independent food selection. Females seemed more likely to prepare foods for themselves. Among female respondents, 74.3 percent reported that they had been involved in preparing foods before, comparing to 42.4 percent of males.

Generally the students in the college were satisfied with its food services. However, some recommendations have been made regarding better food provision at the college. These mainly include: (1) alternate cooking methods frequently to meet the different needs of the students; (2) lengthen meal times, especially the dinner time.

This study indicated that the food service at the college appeared to meet the nutritional needs of the university students.

## **APPENDICES**

### **APPENDIX A            THE QUESTIONNAIRE AND THE 24-HOUR DIETARY RECALL**

## TEN-MINUTE FOOD-RELATED QUESTIONNAIRE

This questionnaire is part of a Wollongong University research project aimed at helping you. Your identities will be safe-guarded, the participation of this survey is entirely voluntary. Only group data will be reported in the final result. When you answer these questions, please circle the appropriate number before the answer you choose, or fill in the blank.

Please return this questionnaire and the dietary recall to the office before Friday, August 30, 1991, no later than 5:00 p.m.

Thank you very much for your cooperation.

Please don't use  
these boxes.

1. What was your age at your last birthday? \_\_\_\_\_ Years.

1	2
---	---

2. Sex. (0) female (1) male

3
---

3. In which country were you born? \_\_\_\_\_.

4	5
---	---

4. Ethnic racial group \_\_\_\_\_.

6	7
---	---

5. The main language you speak at home: \_\_\_\_\_.

8	9
---	---

6. How long have you been in Australia?

10	11
----	----

(1) Since I was born.

(2) \_\_\_\_\_ Months.

7. How long have you been in the university accommodation in Wollongong? Please indicate all the colleges where you have lived or where you are living.

International House \_\_\_\_\_ months

12	13
----	----

Campus East \_\_\_\_\_ months

14	15
----	----

Weerona \_\_\_\_\_ months

16	17
----	----

Kooloobong \_\_\_\_\_ months

18	19
----	----

Gundi \_\_\_\_\_ months

20	21
----	----

8. What course are you studying in Wollongong?

☐  
22

- (1) undergraduate course
- (2) master course
- (3) PhD course
- (4) English course
- (5) other\_\_\_\_\_.

9. What is your marital status?

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23

- (1) single
- (2) married
- (3) living in a de-facto relationship
- (4) divorced or separated or widowed
- (5) others. Please specify \_\_\_\_\_.

10. Had you been living away from home before you came to Wollongong?

☐  
24

- (1) Yes.  
If yes, for how long?\_\_\_\_\_months.
- (2) No.

☐☐  
25 26

11. Were you involved in preparing the daily meals in your house before you came to Wollongong?

☐  
27

- (1) Yes.
- (2) No.

12. What is your budget per week after paying rent to the college?

☐☐☐  
28 29 30

\_\_\_\_\_Dollars.

13. What is (are) the source(s) of this income? Please circle the main ones only.

☐  
31

- (1) Family support
- (2) Scholarship
- (3) Work in Australia
- (4) Own savings
- (5) Others \_\_\_\_\_.

14. How many times do you have your meals and snacks per week?

Breakfast \_\_\_\_\_ Times per week

32

Lunch \_\_\_\_\_ Times per week

33

Dinner \_\_\_\_\_ Times per week

34

Snacks \_\_\_\_\_ Times per week

35

15. What do you usually **eat** for snacks? (Please circle the main ones only)

36 37

(1) potato crisps or similar

(2) biscuits / cakes or similar

(3) chocolate / lollies

(4) pies, chips, sausage rolls

(5) ice cream / ice blocks

(6) fruit

(7) yoghurt

(8) sandwiches

(9) other \_\_\_\_\_.

(10) No, I don't eat between meals.

What do you usually **drink** for snacks? (Please circle the main ones only)

38 39

(1) tea

(2) coffee

(3) fruit juice

(4) milk

(5) water

(6) soft drink

(7) alcohol

(8) others \_\_\_\_\_.

(9) No, I don't drink between meals.

16. How many times do you have the meals provided by the college per week?

Breakfast \_\_\_\_\_ Times per week

40

Lunch (packing sandwich) \_\_\_\_\_ Times per week

41

Dinner \_\_\_\_\_ Times per week

42

17. How do you usually prepare the meals when you are away from college (not including the sandwich from college) ?

a) During days at University

☐

43

- (1) Buy from university Union or canteen
- (2) Take away foods
- (3) Eat in restaurant
- (4) Cooking in family or friend's place
- (5) Cooking for yourself
- (6) Other\_\_\_\_\_.

a) Evenings or days not at University

☐

44

- (1) Take away foods
- (2) Eat in restaurant
- (3) Cooking in family or friend's place
- (4) Cooking for yourself
- (5) Other\_\_\_\_\_.

18. When the regular meals at the college are substituted by other meals, how important are each of the following to you? Please circle a number for each line.

	most important							not important
Better choice of food	1	2	3	4	5	6	7	<input type="checkbox"/> 45
Increase variety of food	1	2	3	4	5	6	7	<input type="checkbox"/> 46
Increase quantity of food	1	2	3	4	5	6	7	<input type="checkbox"/> 47
Convenience	1	2	3	4	5	6	7	<input type="checkbox"/> 48
Sociable with friend	1	2	3	4	5	6	7	<input type="checkbox"/> 49
Cost	1	2	3	4	5	6	7	<input type="checkbox"/> 50
Specific meals not provided at the college	1	2	3	4	5	6	7	<input type="checkbox"/> 51
Missed meal time	1	2	3	4	5	6	7	<input type="checkbox"/> 52
Other_____	1	2	3	4	5	6	7	<input type="checkbox"/> 53



19. If you skip a meal, what is the most important reason for you? Please circle the appropriate response.

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54 55

- (1) not hungry
- (2) don't want to prepare food
- (3) too busy
- (4) lack of money
- (5) lack of variety of foods
- (6) lack of shopping or cooking facilities
- (7) other\_\_\_\_\_.
- (8) do not skip meals

20. In what ways would you like to change the foods you eat? (e.g. less meat or coffee, more fruits or vegetables, etc.) Please state the main changes you would like to make and why you would like to make them.

☐ ☐  
56 57

21. Have you experienced any of the following problems since you have been in Australia? Briefly describe the type of problem, please.

			Comments	
Financial	Yes	No	_____.	<input type="checkbox"/> <input type="checkbox"/> 58 59
Climate	Yes	No	_____.	<input type="checkbox"/> <input type="checkbox"/> 60 61
Lack of friends	Yes	No	_____.	<input type="checkbox"/> <input type="checkbox"/> 62 63
Foods	Yes	No	_____.	<input type="checkbox"/> <input type="checkbox"/> 64 65
Time management	Yes	No	_____.	<input type="checkbox"/> <input type="checkbox"/> 66 67
Study technique	Yes	No	_____.	<input type="checkbox"/> <input type="checkbox"/> 68 69
Language	Yes	No	_____.	<input type="checkbox"/> <input type="checkbox"/> 70 71
Other_____	Yes	No	_____.	<input type="checkbox"/> <input type="checkbox"/> 72 73

22. What do you usually do for lunch on Saturday and Sunday?

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74 75

Saturday

Sunday

(1) cook for myself

(1) cook for myself

(2) take away foods

(2) take away foods

(3) eat at restaurant

(3) eat at restaurant

(4) eat in family or friend's place

(4) eat in family or friend's place

(5) other \_\_\_\_\_.

(5) other \_\_\_\_\_.

(6) do not eat lunch

(6) do not eat lunch

☐

76 77

23. Are you basically satisfied with the meals provided by the college?

☐

78

(1) Yes

(2) No

How is your satisfaction with these meals? Please place a mark on the following scale.

Very good      Good      Not bad      Poor      Very poor  
(1)              (2)              (3)              (4)              (5)  
| \_\_\_\_\_ | \_\_\_\_\_ | \_\_\_\_\_ | \_\_\_\_\_ |

☐

79

24. How would you like to change the meals which are prepared for you at the college?

(1) Enhance quantity

(2) Alternate cooking ways

(3) Change the time when foods are available

(4) Do not want to change the meals

(5) Others: \_\_\_\_\_.

☐

80

Comments:

☐

81 82

25. Would you like to have your diet computer analysed to find out if you eating a balanced diet?

(1) Yes. If yes, please see next page to help us to get information.

(2) No.

☐

83

## 24-HOUR DIETARY RECALL

### How to fill in your recall form.

- Please write down your name and number on next page so that we can inform you the diet computer analysed result.
- Write down everything that you ate or drank during the preceding 24 hours, include all foods, beverages, nutrient supplements, vitamins, etc. Include all your meals and between-meal snacks.
- You will need to fill in five columns.

### Column 1: Place Eaten

- Where food is eaten.  
e.g. living room, college dining hall, restaurant, kitchen, office, union, friend's place.

### Column 2: Time

- Write down every time you started to eat or drink.
- Write down a.m. for morning and p.m. for afternoon or evening.

### Column 3: Description of Food or Drink (Give Brand Name if Applicable)

- Please indicate if the food is provided by the college or not.
- If the food is **not** provided by the college, describe the type of food you have eaten, giving as many details as possible.  
e.g. if you drank milk, indicate whether you had whole, skim or other milk,  
if you had bread, indicate whether you had white, brown or other bread.
- Include the brand name of commercial products.
- Indicate whether the item was fresh, canned, or frozen.
- If the dish is a mixture of several foods, name the dish, and all the separate ingredients you can see in it or know are there. Examples of food mixtures include stew, soup, coleslaw and mashed potato.
- For sandwiches and rolls, name each ingredient and the number of sandwiches or rolls eaten (1 sandwich has 2 slices of bread).
- Remember to record foods added to other foods such as milk or sugar in tea and coffee; gravy, sauce or pickles on meat or in sandwiches; cream or ice-cream on dessert; flavourings such as ice-cream, topping or Milo in milk drink.

**Column 4: How Prepared**

- Describe how the food was prepared: raw, baked, boiled, steamed, fried, stir-fried, poached, grilled, toasted, broiled, microwaved, or just provided by the college.

**Column 5: Amount Eaten**

- Use teaspoon, tablespoon, ml, thick or thin piece; for butter or margarine, you use thick or thin spread on bread, etc.
- For a dish that is a mixture of several foods, write down the total amount of the mixed dish eaten. There is no need to recall the amount of each separate ingredient.
- Remember to add second helpings.

**SAMPLE**

Place eaten	Time	Description of food/drink: give brand name if applicable	How prepared	Amount eaten
dining hall	8:00am	white bread	toast	2 slices
		Margarine (Meadow Lea)		1 teaspoon/thinly spread
		Cottee's strawberry jam		2 teaspoons
my office	11:00am	Lipton tea	boiling water	1 tea bag, 250ml water
		Whole milk		30 ml
		White sugar		2 teaspoons
dining hall	5:30pm	roast beef	by college	1 serve
		gravy	by college	1 tablespoon
		potato, roast	by college	half one approx 5cm diam
		cauliflower, steamed	by college	~ 3 X 7 X 5 cm
		orange juice, 100%	by college	3/4 cup (250ml/cup)
		mushroom salad	by college	3 tablespoons
Pizza Hut	10:30pm	double cheese pizza, pan fried	Pizza Hut	1/2 small size
		coke	Pizza Hut	1 large glass



### Additional Questions:

1. Is this a typical day in term of your intake?

Yes ( ) No ( )

☐

If not, what is different about it?

84  
☐☐  
 85 86

2. Have you included all drinks, including alcohol?

3. Have you included all snacks? e.g. chocolate, nuts, chewing gum, drinks, etc.

4. Have you included the salt that you added to your meal?

5. Do you take vitamin or mineral supplements?

Yes ( ) No ( )

☐

87

If yes, what kind and how many per day or week?

	Brand	Number of Tablets / Volume	
		per day	or per week
Multivitamin		<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
		88 89	90 91
Iron		<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
		92 93	94 95
Ascorbic Acid		<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
		96 97	98 99
Other (list)		<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
		100 101	102 103

**\* You may be contacted again to double check the information.**

## APPENDIX B: COMPUTER PROGRAMS\*

### Computer Program - 1: Questionnaire

```

file handle infile1 / name='mjdata1'
file handle out1 / name='qu'
data list file=infile1 fixed records=4
/1 id 1-2 q1 4-5 q2 7 q3 9-10 q4 12-13 q5 15-16
q6 18-20 q7 22-23 q8 25-26 q9 28-29 q10 31-32
q11 34-35 q12 37 q13 39 q14 41-43 q15 45 q16 47-49
q17 51 q18 53 q19 55 q20 57 q21 59
/2 q22 3 q23 5 q24 7 q25 8-9 q26 11 q27 13 q28 15
q29 17 q30 19 q31 21 q32 23 q33 25 q34 27 q35 29
q36 31 q37 33 q38 35 q39 37 q40 39 q41 41 q42 43
q43 45 q44 47 q45 49 q46 51 q47 53 q48 55 q49 57 q50 59
/3 q51 3 q52 5 q53 7 q54 9 q55 11 q56 13 q57 15 q58 17
q59 19 q60 21 q61 23 q62 25 q63 27 q64 29 q65 31 q66 33
q67 35 q68 37 q69 39 q70 41 q71 43 q72 45 q73 47 q74 49
q75 51 q76 53-54 q77 56 q78 58 q79 60
/4 q80 3 q81 5 q82 7 q83 9 q84 11 q85 13 q86 15 q87 17
q88 19 q89 21 q90 23 q91 25 q92 27 q93 29 q94 31 q95 33
q96 35 q97 37 q98 39 q99 41 q100 43 q101 45 q102 47
q103 49 q104 51-52 q105 54
missing value q25 (99)
variable labels
q1 'age'/
q2 'sex'/
q3 'country of birth'/
q4 'ethnic racial group'/
q5 'language'/
q6 'time in Australia'/
q7 'time in International House'/
q8 'time in Campus East'/
q9 'time in Weerona'/
q10 'time in Kooloobong'/
q11 'time in Gundi'/
q12 'course'/
q13 'marital status'/
q14 'away from home before'/
q15 'involved in cooking'/
q16 'budget'/
q17 'family support'/
q18 'scholarship'/
q19 'work in Australia'/
q20 'own savings'/

```

---

\* There were up to 20 programs written for analysis of the data. Only the main ones are illustrated here.

- q21 'others'/
- q22 'breakfast/week'/
- q23 'lunch/week'/
- q24 'dinner/week'/
- q25 'snacks/week'/
- q26 'potato crisps or similar for snack'/
- q27 'biscuits/ cakes or similar for snack'/
- q28 'chocolate/lollies for snack'/
- q29 'pies, chips, sausage rolls for snack'/
- q30 'ice cream/ice blocks for snack'/
- q31 'fruit for snack'/
- q32 'yoghourt for snack'/
- q33 'sandwiches for snack'/
- q34 'others for snack'/
- q35 'Do not eat between meals'/
- q36 'tea for snack'/
- q37 'coffee for snack'/
- q38 'fruit juice for snack'/
- q39 'milk for snack'/
- q40 'water for snack'/
- q41 'soft drink for snack'/
- q42 'alcohol for snack'/
- q43 'others for snack'/
- q44 'Do not drink between meals'/
- q45 'breakfast in college/week'/
- q46 'lunch in college/week'/
- q47 'dinnerin college/week'/
- q48 'buy from uni. union or canteen/day at uni'/
- q49 'take away foods'/
- q50 'eat at restaurant'/
- q51 'cooking in family for friend place'/
- q52 'cooking for myself'/
- q53 'others'/
- q54 'take away foods/day not in uni.'/
- q55 'eat at restaurant'/
- q56 'cooking in family or friend place'/
- q57 'cooking for myself'/
- q58 'others'/
- q59 'better choice of food'/
- q60 'increase variety of food'/
- q61 'increase quantity of food'/
- q62 'convenience'/
- q63 'sociable with friend'/
- q64 'cost'/
- q65 'specific meals not provided at college'/
- q66 'missed meal time'/
- q67 'other'/
- q68 'not hungry'/
- q69 'do not want to prepare food'/
- q70 'too busy'/
- q71 'lack of money'/
- q72 'lack of variety of foods'/
- q73 'lack of shopping or cooking facilities'/
- q74 'other'/
- q75 'do not skip meals'/



```

q76 'food change attitude'/
q77 'financial problem'/
q78 'climate problem'/
q79 'lack of friends'/
q80 'foods problem'/
q81 'time management'/
q82 'study technique'/
q83 'language'/
q84 'other'/
q85 'cook for myself/Saturday lunch'/
q86 'take away foods'/
q87 'eat at restaurant'/
q88 'eat in family or friend plance'/
q89 'other'/
q90 'do not eat lunch at Saturday'/
q91 'cook for myself/Sunday lunch'/
q92 'take away foods'/
q93 'eat at restaurant'/
q94 'eat in family or friend place'/
q95 'other'/
q96 'do not eat lunch at Sunday'/
q97 'satisfied with college meals'/
q98 'degree of satisfaction'/
q99 'enhance quantity'/
q100 'alternate cooking ways'/
q101 'change the time when foods are available'/
q102 'do not want to change the meals'/
q103 'other'/
q104 'comments'/
q105 'dietary recall'/
value labels
q2 0 'female' 1 'male'/
q3 1 'Australia' 2 'Canada' 3 'China' 4 'H.K.' 5 'India'
    6 'Indonesia' 7 'Korea' 8 'Malasia' 9 'NZ' 10 'Taiwan'
    11 'UK' 12 'USA' 13 'Panama'/
q4 1 2 3 'A-S/Cauc' 4 'Chinese' 5 'A-S/Cauc' 6 'Hungarian'
    7 'Indian' 8 'Indonesian' 9 'Malaysian' 10 'A-S/Cauc'
    11 'Jew' 12 'Korean' 13 'Italian'/
q5 1 'Chinese' 2 'English' 3 'Hungarian' 4 'Indonesian'
    5 'Korean' 6 'Malaysian' 7 'other'/
q6 900 'since born'/
q12 1 'undergraduate' 2 'master' 3 'PhD' 4 'English' 5 'other'/
q13 1 'single' 2 'married' 3 'de-facto'
    4 'divorced/separated/widowed'/
q14 0 'no'/
q15 1 'yes' 2 'no'/
q17 to q21 1 'yes' 2 'no'/
q26 to q44 1 'yes' 2 'no'/
q48 to q58 1 'yes' 2 'no'/
q67 0 'no'/
q68 to q97 1 'yes' 2 'no'/
q98 1 'very good' 2 'good' 3 'not bad' 4 'poor' 5 'very poor'/
q99 to q105 1 'yes' 2 'no'/
list variables=all/
cases = from 1 to 68
save outfile=out1/
keep =all/map
finish

```

## Computer Program - 2: 24-Hour Recall

```

file handle infile1 / name='dietdata1'
file handle out1 / name='dietdata2'
data list file=infile1 fixed records=2
/1 id 1-2 q1 4-5 q2 7 q3 9 q4 11-13 q5 15-19 q6 21-22
q7 24-25 q8 27-28 q9 30-31 q10 33-34 q11 36-37
q12 39-40 q13 42-44 q14 46-48 q15 50-51 q16 54-56
/2 q17 3-5 q18 7-9 q19 11-13 q20 15-17 q21 19-21
q22 23 q23 25
missing values q1 to q23 (99)
variable labels
q1 'age'/
q2 'sex'/
q3 'country of birth'/
q4 'time in Australia'/
q5 'total energy (KJ)'/
q6 'protein-energy %'/
q7 'fat-energy %'/
q8 'carbohydrate-energy %'/
q9 'alcohol-energy %'/
q10 'Poly FA'/
q11 'Mono FA'/
q12 'Saturated FA'
q13 'Protein RDI %'/
q14 'Retinol RDI %'/
q15 'Vit.C RDI %'/
q16 'Iron RDI %' /
q17 'Zinc RDI %'/
q18 'Potassium RDI %'/
q19 'Calcium RDI %'/
q20 'Phosphorus RDI %'/
q21 'Magnesium RDI %'/
q22 'typical day'/
q23 'supplement'
value labels
q2 0 'female' 1 'male'/
q3 1 'Australia' 2 'Non Australian'/
q4 100 'since born' 900 'not born in Australia'/
q13-21 999 '>1000%'/
q22 1 'typical day' 2 'not typical day'/
q23 1 'supplement' 2 'no supplement'
list variables=all/
cases = from 1 to 32
save outfile=out1/
keep =all/map
finish

```

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